



Montana PSC Load Management Workshop

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OVERVIEW

- Focus will be on planning and implementation of Load Management programs
- Background has been set regarding why Load Management is becoming an issue in the Northwest
 - What are different types of Load Management programs?
 - What are some emerging technologies that will make Load Management increasingly viable?
- What are some utilities that have successfully run Load Management programs?
- What is going on in California?
- Conclusions



Principle One-Load Management Is Not Energy Efficiency

- Energy Efficiency and Load Management are both Demand-Side management tools, but they are very different animals.
- Energy Efficiency and Conservation are used synonymously here in the Northwest.
- Energy Efficiency is a step that permanently changes the way in which electricity is consumed, so end-user knows what to expect and is able to adjust as needed.
- Load Management typically affects the pattern of electric use and consumption on a variable basis, so end-users may notice when Load Management is exercised.



Types of Load Management Programs

- Load Management is an agreement or appeal by a utility to an end-user to alter the manner in which electric power is being consumed through mechanisms such as:
 - Price signals (Time of use, Real Time Pricing, or another pricing option)
 - Automatic dispatch
 - Voluntary dispatch
 - Mandatory dispatch
 - Auxiliary Generation
- Each of these options can be used with any segment of end-use consumers, but certain approaches work most effectively with specific market segments.



Emerging Load Management Technologies

- Load Management has proven track record at many utilities, so there are proven methods and technologies.
- With ever-improving electronics, software and communications, Load Management can be done more seamlessly and with less negative impact on end-users.
 - For example, rather than cycling a heater or air conditioner in a home with radio dispatch, a power line carrier can send a signal to a thermostat to adjust the temperature setting by two degrees for set period of times.
- Prices for these new technologies are dropping and will continue to drop, making Load Management even more viable.



Examples of Emerging Load Management Technologies

- Pacific Northwest Laboratory Grid Friendly Chip
- California Energy Commission working on communicating thermostat project
- Hawaii Electric Company installing 5000 Direct Load Control units/month on air conditioning units in Hawaii that respond to under frequency
- Two way broadband demonstrations in Ashland and Olympic Peninsula



Utilities That Have Run Successful Load Management Programs

- 69 utilities around US have Direct Load Control programs
- 5000+ MW of load control
- 15+ years of experience
- 6+ million devices
- No device failures resulting in fire
- Florida Power and Light long time leader with 50% of residential customers participating
- Pacificorp – Salt Lake City 100+ MW

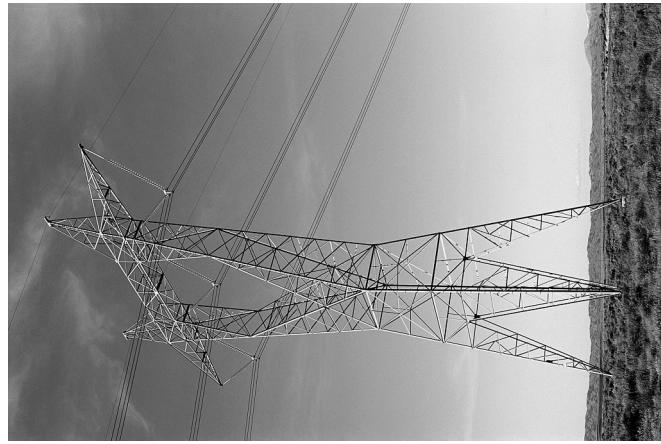


Florida Power & Light Experience – 15 years

Load Control Programs at FPL

• Residential and Business On Call

- Direct Control – Bidirectional
- Powerline Communications System
- First Units Installed in 1987
- 710,000 Customers
- 815,000 Transponders
- 1,000 MW in Normal Operation
- 2,000 MW in an Emergency – SCRAM
- 460 Substations Equipped for On Call

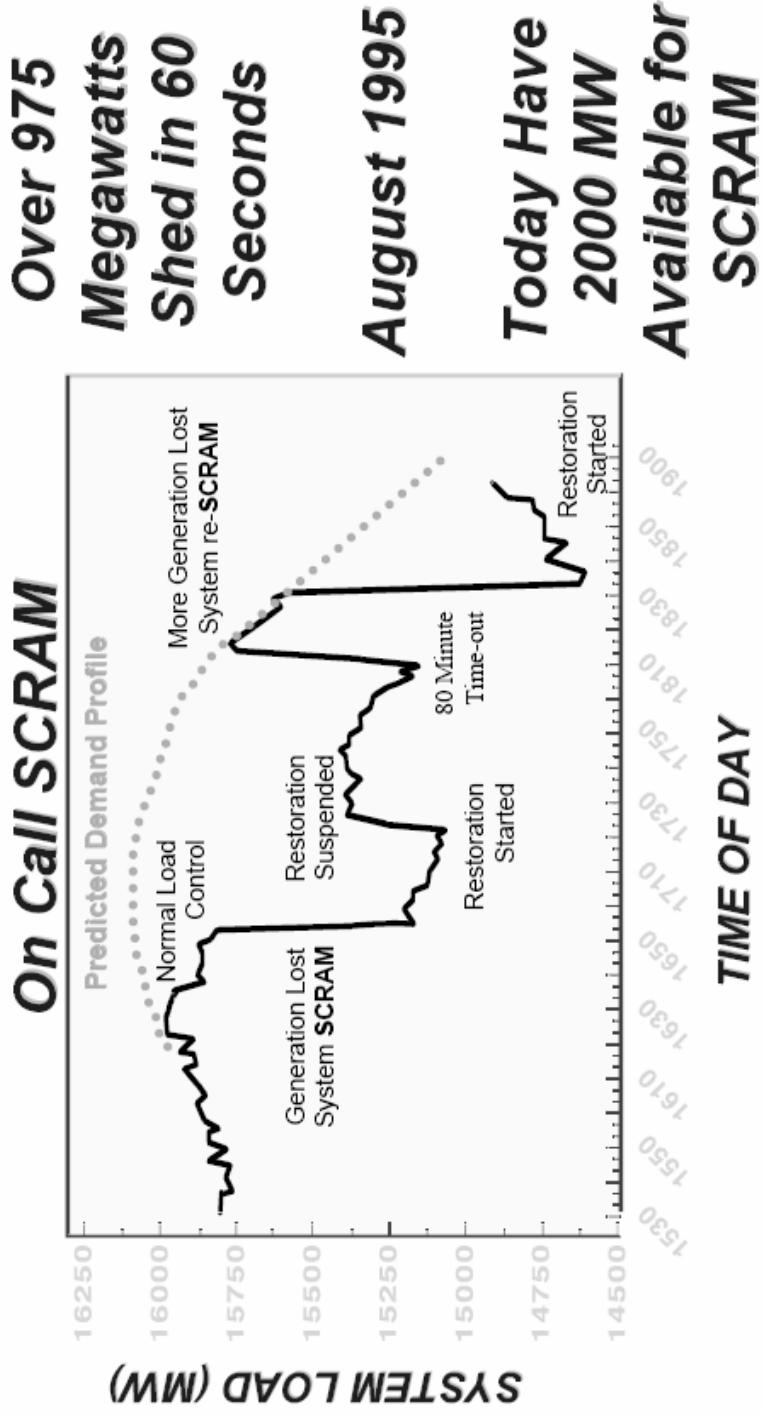




Florida Power & Light Experience – 15 years *Continued*

Does On Call Work ???

On Call SCRAM



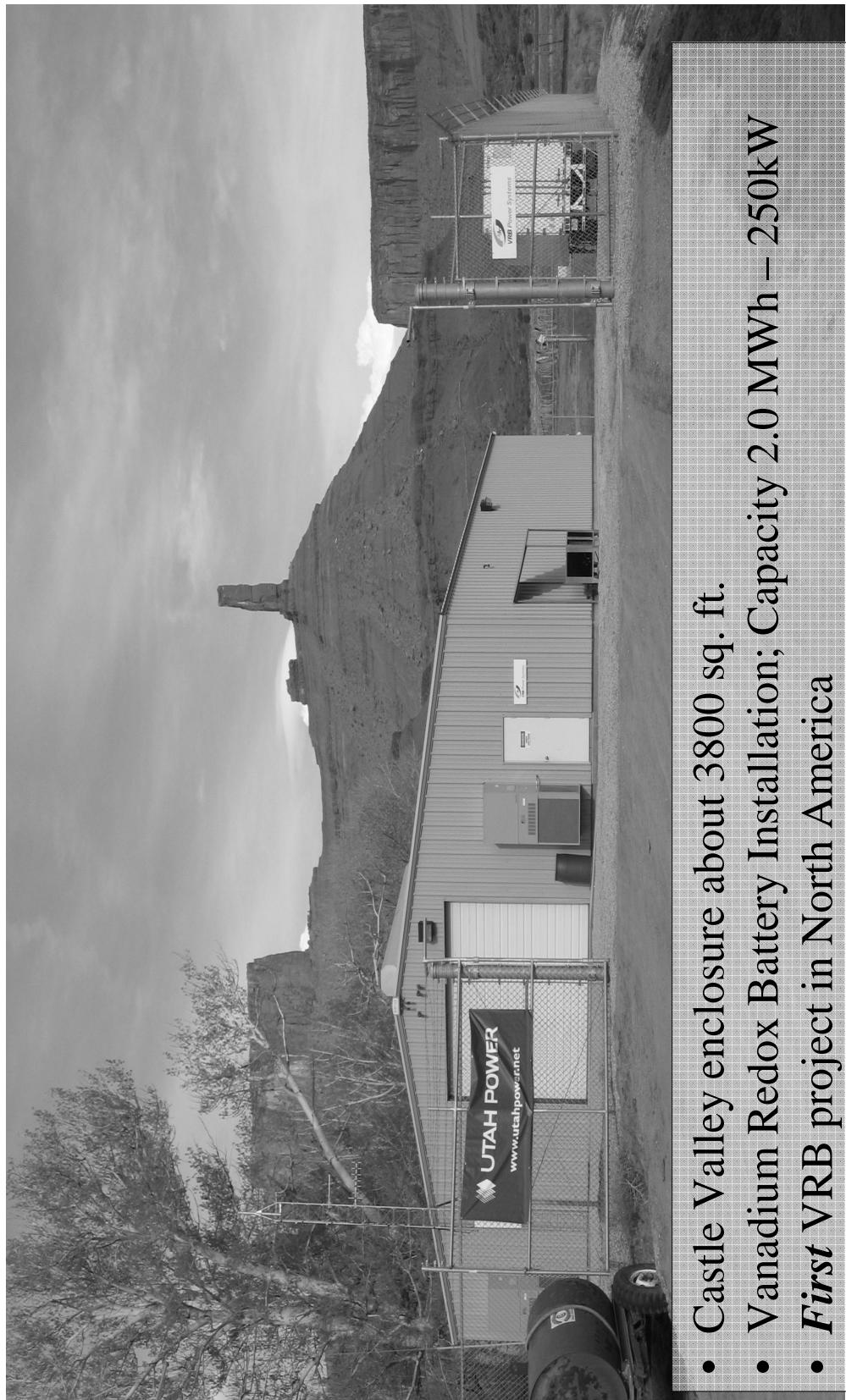


Sacramento Municipal Utility District

- Variety of Load Management Programs including Air Conditioning Load Management (ACLM), Auxiliary Generation, Large Commercial and Industrial Load Management (Both Voluntary and Incentive Based), and Temperature Dependent Pricing.
- If all demand options exercised at once, over 300 MW of peak could be clipped (or 15% of peak summer day load).
- Largest program was ACLM with 35% of residential customers with central air conditioning participating (220 MWs).



PACIFICORP – Castle Valley Site Energy Storage



- Castle Valley enclosure about 3800 sq. ft.
- Vanadium Redox Battery Installation; Capacity 2.0 MWh – 250kW
- *First* VRB project in North America



PACIFICORP ‘Cool Keeper’ Program

- Air Conditioning Direct Load Control Program – Salt Lake City (Utah Power)
 - Launched – June 20, 2003
 - Ten Year Contract
 - Turn-key
 - Vendor Owned
 - Pay-for-Performance
 - Target Market – Residential And Small Commercial
 - Controlled Load Objective - Build Out For 3 Years To 180 MW Total



California Statewide Pricing Pilot

- Test time varying rates (TOU & Critical Peak Pricing) against 5-tier inverted.
- Critical Peak Pricing rates between 50 cents and 75 cents per kWh
- Pilots conducted over past several years.
- Findings:
 - Residential Fixed control strategy reduced peak by more than 13% (impact 2 times greater in hotter zones)
 - Residential Variable control strategy customers with smart thermostat saw 27% peak reduction
- Satisfaction among participants was high and nearly all customers felt that the rates were fair.



California Demand Response Advanced Meter Infrastructure Implementation Schedules

- PG&E (5 million meters)
 - Start meter installation 1st quarter 2006
 - Complete meter installation in 2011

- SDG&E (1.3 million meters)
 - Start deployment early 2007
 - Complete meter installations 2009



California Demand Response Advanced Meter Infrastructure Implementation Schedules

Continued-

- SCE (4.6 million meters)
 - No schedule established concerning rollout of AMI program
 - 18 month Phase 1 of 2 Phase pre-deployment plan (studies)
 - Upon completion of Phase 1 SCE will decide whether to seek further funding from ratepayers for Phase 2 (pilot)
 - CPUC decision on SCE plan scheduled for early 2006

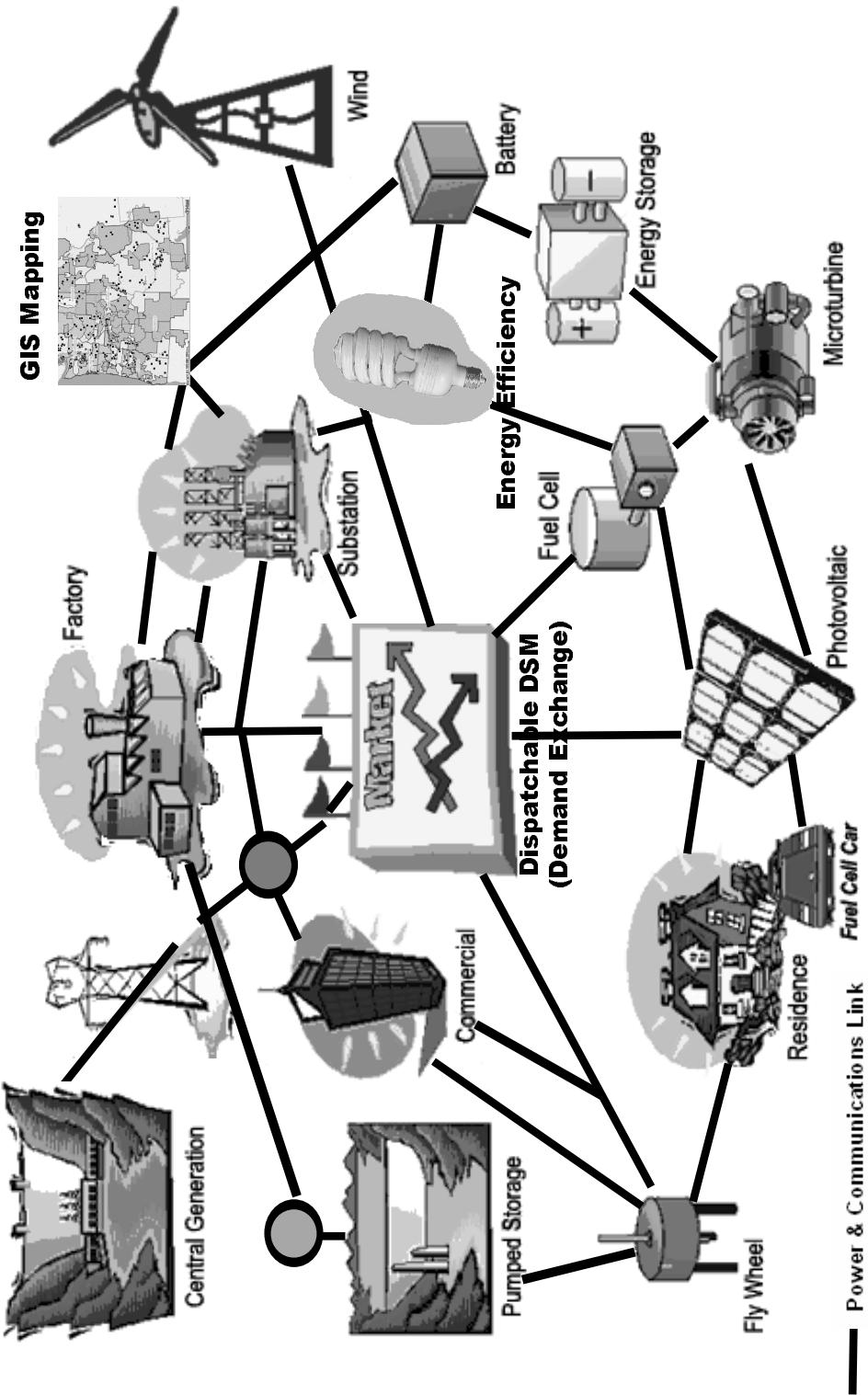


What Is BPA Up to In Load Management

- BPA's Energy Web and Non-Wires Solutions both contain Load Management elements.
- Non-Wires Solutions (NWS) is BPA's work to change Transmission Planning Process to ensure non-build options are fully analyzed and compared against build early in the planning process.
- For purposes of this discussion, hence forth all BPA projects will be arrayed as part of NWS.
- BPA developing Load Management Strategic Plan in response to Fifth Power Plan.



EnergyWeb





Ashland Residential Direct Load Control

- 2 Year Pilot Project (Summer 2004-Summer 2006).
- 100 Homes & 3 Commercial Sites.
- Broadband based, two-way communication
- Sites remotely controlled via Internet.
- Summer 2005 Results: achieved between 1.0 and 1.5 kW per connected home.
- Winter 2004/05 Results: achieved between 1.0 and 1.8kW per connected home.
- Consumers embraced the interface and ability to check and control home from remote locations.



Ashland Commercial Direct Load Control *continued-*

- Ashland Public Library – Controlling 13 heat pumps and a few lighting circuits.
- Ashland YMCA – Duty cycle 12 rooftop air conditioning units, cooling only.
- Ashland Windmill Inn – Control 100 room air conditioners.
- Curtailments have occurred winter 2005, summer 2005, and on-going winter 2006.
- Data analysis pending.



Richland Direct Load Control and Distributed Generation Projects

- Four Buildings on PNNL Campus selected for pilot.
- Controlled Loads include: Rooftop Units, Duty Cycling of Air Handling Units, Cooling Pond Pumps, Chiller and Air Handler Controls.
- 152-257 kw at curtailable load delivered.
- 30-kW Capstone microturbine system installed on PNNL campus.
- The microturbine controls were integrated with PNNL's existing enterprise-wide energy management and controls system.
- PNNL developed a web interface providing easy access to the enterprise EMCS and the ability to monitor and start/stop the turbine remotely.



Distributed Generation Aggregation

- Goal is to create an operable network of dispatchable DG resources.
- Network will use consumer-owned standby generation.
- Pilot target resources total approximately 5 MW.
- Manage and control resources through internet-based communications & applications platform.
- Findings:
 - High \$/kW required especially for remote locations
 - Air quality and permitting can significantly delay implementation
 - Retrofitting existing units can be costly (both \$ and time)



Irrigation Motor Load Control

- 5MW+ of curtailable load signed up in program.
- Project duration: July, August, and September 2005.
- Interruptions: Maximum ten, weekdays only and no consecutive day interruptions, not to exceed four hours 4:00-8:00p.m.
- 24 hour advance notice and day of confirmation sent via e-mail and telephone.
- No penalties for a non-compliance rate of less than 10% of committed load.
- Incentive payments: one-time payment of \$2 per kW of committed load reduction at sign-up and \$1.50 per kW per month for each kW of reductions made, subject to compliance verification.
 - The average load reduction over all events is 4.2 MW, this is an average compliance rate of 75%.
 - Growers said they would participate in program like this again.



Olympic Peninsula Direct Load Control

- Three participating utilities: Mason County PUD #3, Mason County PUD #1, and Clallam County PUD.
- 2500 homes total for targeted 5 MW of curtailable load.
- Appliances controlled include space heating/cooling & water heaters.
- One-way pager based system.
- Highly successful marketing began August 2005 – achieved participation goal within first 6 weeks.
- Installations slowed with beginning of heating season.
- First control event generated zero consumer calls.



Pacific Northwest GridWise™ Demonstration Project

- Pacific Northwest GridWise Demonstration participants include:
Bonneville Power Administration, PNNL, Portland General Electric,
PacificCorp, Clallam County PUD, City of Port Angeles, IBM, and
Whirlpool.
- Market “experiment” focuses on 200 residential customers on
Olympic Peninsula.
- Virtual distribution feeder will be created in software as if the
resources involved were literally co-located on a single feeder.
- Real-time and historical display of resource operations and costs.
- Benefits involve testing a system, not just one technology.
- Virtual, near real-time market operating environment
 - backed with real cash incentive to participants
 - provides incentive to operate the resources in collaboration with
grid



Grid Friendly™ Appliance Field Demonstration Project

- Apply autonomous GFA under frequency curtailment response to 200. appliances in 150 residences: 150 Whirlpool dryers and 50 water heaters.
- Appliances located on Olympic Peninsula and the city of Yakima in Washington and in Gresham, Oregon.
- Extend GFA intelligence, once sited, to conventional demand response.
- Assess consumer acceptance – Whirlpool post-survey.
- Near-term benefits
 - Demonstration of inexpensive, distributed, autonomous under frequency curtailment response
 - Utilities become familiar with and accepting of Grid Friendly approach
 - Appliance manufacturers become familiar with and accepting of Grid Friendly approach
- Long-term benefits
 - GFA = Spinning reserve
 - Industry moves toward common GFA agent
 - Installation of GFA directly into appliances



Strong Partnerships Foster Load Management Development

- NW Energy Technology Collaborative: PNL, Avista, Puget Sound Energy, Washington State, BC Hydro, Tacoma Power, Snohomish PUD.
- Pacific Northwest Gridwise Test Bed: Portland General Electric, PacifiCorp, BPA, Whirlpool, PNL.
- Gridwise Alliance (BPA Chairs Demonstration Committee).
- Olympic Peninsula Gridwise Demonstration: PNL, BPA, AREVA, Celerity Energy, City of Port Angeles, Mason PUD #1, Mason PUD #3, Clallam PUD, Montana Tech Grid Testing Facility.
- Intellegrid Initiative – CEIDS participant.
- Gridwise Architecture Council: BPA participant is Don Watkins.
- Poised for Profit Study.



Conclusions

- Load Management will be an increasingly valuable tool in Northwest and Nationally.
- BPA taking first steps to analyze Load Management strategy and to gain experience through NW/S demonstrations.
- Northwest should track experience(s) elsewhere to enhance the likelihood of success for day when Load Management is really needed in the Northwest.



Bonus Presentation

Mike Weedall's
On The Ground Observations About
Delivering Load Management*

*These lessons-learned are the personal observations of Mike Weedall
and are not BPA policies or positions.



On The Ground Observation

- Energy Efficiency and Load Management are very different animals.
- Load Management means you are impacting the normal pattern of energy use, so end-users are now operating out of their typical behavior and consumption.
- Depending on the technology and manner in which Load Management is structured, there may be no energy savings for the end-user (consumption is just shifted) and energy consumption may actually increase unless the program is structured and managed correctly.
- Depending on the end-user sector, technology being employed, and pattern of the load shift, there are vastly different needs to manage customers.



On The Ground Observation

Continued-

- Many end-users are more than willing to participate in Load Management program if they understand the need.
 - SMUD – “I don’t give up control of my air conditioner on the hottest day for the lousy \$20.”
 - SMUD – “I love the air conditioning Load Management (ACLM) because it helps our community. But do you have to cycle my air conditioner when it is hot?”
 - SMUD – For an incentive payment, 15-20 MW’s of large commercial and industrial load was available, and 90 MW’s was available from that customer segment on a no-pay, voluntary basis.
 - SMUD – “Why should I be in the residential ACLM program and be hot and uncomfortable, and looking across the street at my neighbor who is not in the program and is cool as a cucumber?”
 - SMUD – On a day when an industrial customer was sent a price signal that the price of a kWh would be \$.23, the customer could not curtail operations as it was the last day of the month and they had a production quota to meet.



What Do End-users Want in Return for Participating in Load Management Programs?

- For real estate, the top drivers are always, “Location, location, location.”
- For Load Management, the top drivers are, “Marketing, marketing, marketing.”
- Customers want choice, e.g., level of Load Management impact, an opt out day, etc.
- Stuff will happen— the best designed and managed programs will have hiccups and glitches.
- Customers want assurance they will not be inconvenienced more than promised.
- If you market a program based-upon reliability needs, do not use the program for economic dispatch.



A Final Word About Voluntary Conservation

- During West Coast Energy Crisis of 2001 in California, there was a call to voluntary conservation and load shifting.
- Significant messaging in addition to Top of The Fold news stories day in and day out.
- Between June-September, 2001, monthly peak demand reduced by an average of 8.4% and consumption by a average of 6.1%.
- Within two years, this impact from call for voluntary conservation had disappeared.
- If you call and the need is real, people will respond.